CLAIMS

1. A field effect transistor comprising:

a substrate comprising a source region and a drain region;

an insulating layer arranged on the substrate; and

a porous body which has pillar-shaped holes arranged on the insulating layer, wherein the porous body includes a semiconductor material.

2. A field-effect transistor, characterized by comprising a porous film, which has pillar-shaped pores almost perpendicular to a substrate, through an insulating layer on a substrate, wherein the porous film is formed by removing a pillar-shaped material from a structure that the pillar-shaped material constituted with including a first component disperses in a member constituted with including a second component which can form a eutectic with the first component.

3. The field-effect transistor according to claim 2, characterized in that the porous film is composed of an insulating material or a semiconductor material.

4. The field-effect transistor according to claim 3, characterized in that the semiconductor material is a material which uses silicon, germanium, or silicon and germanium as a main component.

5. The field-effect transistor according to claim 3, characterized in that the insulating material is a material which uses silicon oxide as a main component.

6. The field-effect transistor according to claim 1, characterized in that average pore diameter of the pillar-shaped pores is 20 nm or less, and mean pore density is 1.5×10^{11} pores/cm^2 or more.

7. The field-effect transistor according to claim 1, having on surfaces of the pillar-shaped pores a detected material for detecting a specific detection material.

8. The field-effect transistor according to claim 7, characterized in that the detection material is a biomaterial.

9. The field-effect transistor according to claim 6, characterized in that the detection material causes a change of an electric charge state by contacting with a detected material.

10. A sensor using the field-effect transistor according to claim 1.

11. A method for producing a sensor using a field-effect transistor, characterized by including:

a step of preparing a structure comprising plenty of pillar-shaped members almost perpendicular to a substrate, and a structural member enclosing these pillar-shaped members;

a step of removing the pillar-shaped members to form pillar-shaped pores in the structural member; and

a step of annealing a porous film made of the structural member in which the pillar-shaped pores are formed.